

Mediastinal parathyroidectomy with the da Vinci robot: Presentation of a new technique

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Localization and removal of ectopic glands is one of the major problems in parathyroid surgery.¹ More recently, minimally invasive techniques have been under evaluation for such indications.^{2,3} The introduction of robotic surgical systems has revolutionized the field of minimally invasive surgery by improving vision and motion control.⁴ We here report on the first thoracoscopic mediastinal parathyroidectomy performed with an operating robot.

Clinical Summary

In a 57-year-old female patient with confirmed primary hyperparathyroidism, computed tomographic 2-methoxy isobutyl isonitrile (MIBI) image fusion localized an ectopic parathyroid in the aortopulmonary window (Figure 1). Informed consent was obtained from the patient, and the operation was performed totally thoracoscopically with the da Vinci robotic system (Surgical Intuitive, Inc, Mountain View, Calif).

The da Vinci robot consists of a master console, where the surgeon handles telemanipulators and optical controls with 3-dimensional vision, and the surgical arm cart, a manipulator unit with two instrument arms and a central arm to guide the two-channel endoscope. The surgeon's movement of the handles is transmitted to the tips of the robotic instruments. The main technologic advantage of this system is that it provides realistic 3-dimensional imaging, motion scaling, and tremor filtration. Thus it allows more precise and accurate endoscopic surgery.⁴

The patient was placed in a right lateral decubitus position with left single-lung ventilation (Figure 2). A 10-mm port for the robotic endoscope was positioned in the 6th intercostal space in the anterior axillary line, and two 8-mm robotic operating ports were placed in the 4th intercostal space, a handbreadth right and left of the first incision. An accessory port was placed in the medioclavicular line through the sixth intercostal space, through which a

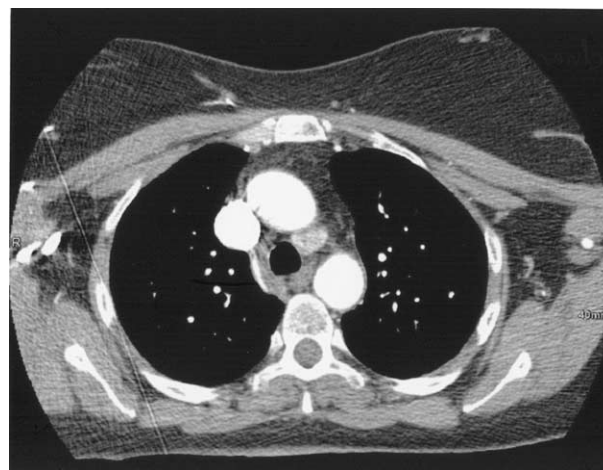


Figure 1. Computed tomographic image showing ectopic parathyroid in aortopulmonary window, adjacent to trachea.

flexible retractor (US Surgical, Norwalk, Conn) was inserted to hold the lung away. A second accessory port through the posterior axillary line of the 6th intercostal space was provided for eventual suction. Resection of the adenoma was performed exclusively by the surgeon at the console. Preparation started with incision of the parietal pleura covering the aortopulmonary window. The left vagal and recurrent laryngeal nerves were identified. Dissection proceeded beyond the small curvature of the aortic arch towards the trachea. The adenoma was identified adjacent to the trachea between the common trunk of the pulmonary artery and the aorta. Robotic manipulation was performed mainly bluntly with partial use of electrocautery, and care was taken not to rupture the adenoma's capsule (Figure 3). The vascular pedicle was controlled with clips. Minor bleeding from adjacent connective tissue was controlled by compression. Once the adenoma had been freed, it was removed with an Endobag system (Auto Suture, Division of US Surgical). At the end of the operation, a chest tube was placed.

Results

The overall operative time was 130 minutes, with 100 minutes for the robotic act alone. Blood loss was minimal, and there were no surgical complications. The patient showed a distinct hoarseness after the operation, which was caused by reduced activity of the left recurrent laryngeal nerve. The chest tube was removed on postoperative day 2, and the patient was discharged on day 4. The 1.4 × 1.0 × 1.0-cm, 1.5-g specimen was histopathologically

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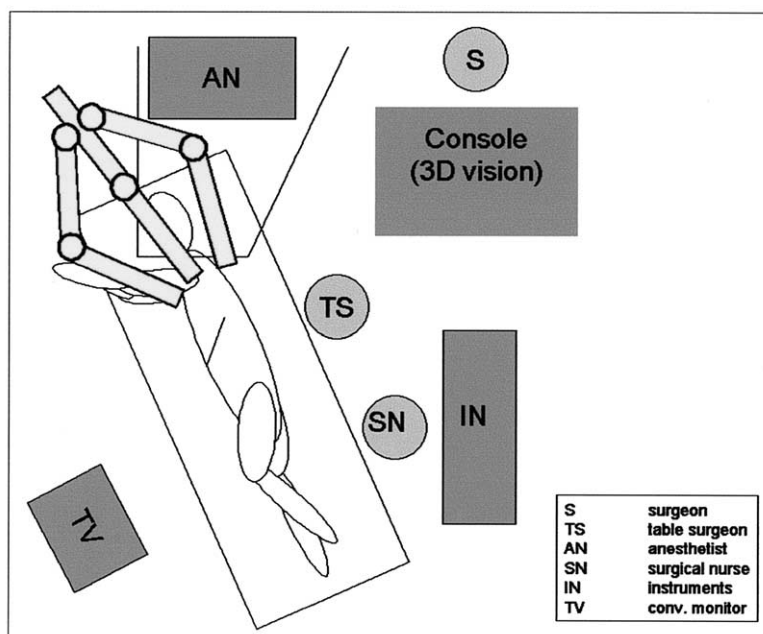


Figure 2. Schematic illustration of adjustment in operating room for ectopic parathyroidectomy with da Vinci robot.

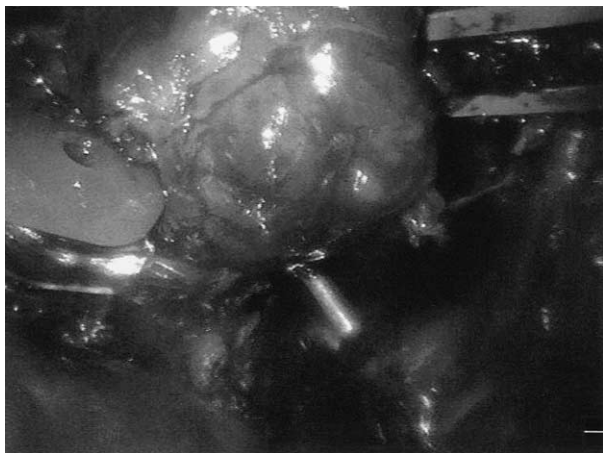


Figure 3. Adenoma (1.5 cm) was dissected with da Vinci robot, mainly bluntly with partial use of electrocautery.

confirmed as a parathyroid adenoma. Six months after the operation, the patient is clinically free of symptoms. Calcium and phosphate blood levels are normal, and her hoarseness has disappeared completely.

Discussion

About 20% of abnormal parathyroid glands are ectopic.¹ In 1% to 2% of cases, the adenoma is located in the lower mediastinum, inaccessible through a cervical approach.⁵ Such ectopic parathyroids have been resected through a sternotomy or thoracotomy.⁵ To reduce the harm of an open operation, video-assisted thoracoscopic surgery has been explored for such purposes during the last

10 years.^{2,3} Recently operating robots have been developed to overcome the drawbacks of video-assisted thoracoscopic surgery, such as impaired dexterity and vision control. The high-quality 3-dimensional camera image allowed easy localization of the tumor by the operating surgeon at the console, whereas the surgeon at the table side found it difficult to identify the lesion on the conventional monitor. The stable operation field and the precise movements of the tips of the instruments were extremely beneficial for operating in a tiny and remote area.

The resection of a parathyroid from the aortopulmonary window was thus proved to be an ideal case for the robot. The robotic procedure was found to be more accurate and safe than conventional video-assisted thoracoscopic surgery.

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